What is claimed is:

1. An electron microscope, comprising:

an irradiation-optical system situated and configured to irradiate a two-dimensional region of a surface of a specimen with charged particles produced by a charged-particle source to cause emission of imaging electrons from the region on the specimen;

an imaging-electron detector having a detection surface; and

an imaging electron-optical system situated and configured to direct the imaging electrons onto the detection surface, wherein the irradiation-optical system controls the charged particles such that changes in potential due to charging by the charged particles in the region of the specimen surface are within a range in which an image can be obtained.

2. The electron microscope of claim 1, wherein the imaging electron-optical system is configured such that each of multiple regions on the specimen surface is irradiated so as to acquire a respective change of surface potential (U_s) that is greater than a respective minimum change of surface potential (U_{min}) needed to produce a viewable image and a respective maximum change of surface potential (U_{max}) beyond which a viewable image cannot be obtained.

3. The electron microscope of claim 1, further comprising a Wien filter situated and configured to direct the beam of charged particles from the irradiation-optical system to the specimen surface.

4. The electron microscope of claim 1, further comprising a cathode lens situated between the Wien filter and the specimen, the cathode lens being configured to decelerate the beam by applying a retarding voltage to the beam.

5. The electron microscope of claim 1, wherein the imaging electron-optical system is configured to change beam current and incident energy of the charged particles in the beam in a repeating manner in serial time segments.

6. A method for performing electron microscopy of a surface of a specimen, the method comprising:

placing the specimen relative to an irradiation-optical system;

irradiating a two-dimensional region of a surface of the specimen by charged particles that have propagated from a source through the irradiation-optical system, such that the irradiation of the region causes emission of imaging electrons from the region on the specimen;

directing the imaging electrons through an imaging electron-optical system to a detection surface of an imaging-electron detector; and

controlling operation of the irradiation-optical system so as to control the charged particles in a manner such that changes in potential due to charging by the charged particles in the region of the specimen surface are within a range in which an image is obtained.

7. The method of claim 6, wherein each of multiple regions on the specimen surface is irradiated with the irradiation beam so as to exhibit a respective change of surface potential (U_s) that is greater than a respective minimum change of surface potential (U_{min}) needed to produce a viewable image and a respective maximum change of surface potential (U_{max}) beyond which a viewable image cannot be obtained.

8. The method of claim 6, wherein operation of the imaging electron-optical system is controlled so as to change beam current and incident energy of the charged particles in the beam in a repeating manner in serial time segments.